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Taro Asano at Princeton

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I knew Taro Asano for only ten months, from his arrival in Princeton in September 1971 to his tragic death in July 1972. I regret now that I did not succeed in getting to know him better. He was shy and did not spontaneously talk about himself. And I did not know that the time I had available to work with him would be so short. We had invited him to stay a second year at Princeton and he had accepted. I was looking forward to seeing more of him during his second year. So I missed the chance of working in close collaboration with him during the brief months that he was here.

He came to see me and discuss his work at irregular intervals. Sometimes he would come several times in a week. Sometimes he would not come for a month. When he came he had always something interesting to report. If he had succeeded in settling a question, he would come in a state of happy excitement. If he had run into an obstacle, he would come in a state of deep sadness and apologize to me for his lack of success. He had high standards and demanded from himself the best of which he was capable. Often he pushed himself to the point of exhaustion.

The main problem on which he was working at Princeton was the extension of "Griffiths Inequalities" to quantum ferromagnets. A Griffiths inequality is a relation between statistical averages of the form

$$< \sigma_A \sigma_B > \geqq < \sigma_A >< \sigma_B > \quad , \tag{1}$$

where σ_A is some product of spin-vectors in the ferromagnet and σ_B is another such product. These inequalities were proved by Griffiths [1] for classical ferromagnets and later generalized by Kelly and Sherman [2] and by Fortuin, Ginibre and Kasteleyn [3]. They have been very useful for establishing in a simple and rigorous way the basic thermodynamic properties of classical ferromagnets. Unfortunately it was discovered by Hurst and Sherman [4] that the inequality (1) does not hold universally

in quantum ferromagnets. But Asano had a profound belief, based on his physical intuition, that some statement of the same general nature as (1) must also be provable for quantum ferromagnets. To justify this belief with a mathematical proof was the task which occupied the last year of his life. He did not find a proof. But I am convinced that his intuition was correct and that a mathematical confirmation of it will some day be discovered.

The work which made Asano famous [5] is the extension of the Yang-Lee circle theorem [6] to quantum ferromagnets. Yang and Lee had proved their theorem for classical ferromagnets. Asano in 1970 made the brilliant invention of the "contraction operator" D(z,z') which allowed him to prove the theorem for quantum ferromagnets. The contraction operator has the effect, roughly speaking, of ensuring that any suitable statement which is true for a ferromagnet with only two spins is also true for a ferromagnet with any number of spins. It was natural then for Asano, when he came to Princeton in 1971, to try to apply the contraction operator to Griffiths inequalities of the form (1). This was a more difficult task than the extension of the Yang-Lee theorem, because this time he had to discover not merely the method of proof but also the precise statement of the theorem to be proved. I was not surprised that he did not achieve success in ten months, with all the distractions that the move to a new country imposed on him. If he had had his second year in Princeton, I am confident that he would have succeeded.

In May 1972 Taro wrote for me a letter in the form of an autobiography, describing his career as a physicist. I quote from this letter the passage in which he writes of the climax of his long struggle with the Yang-Lee theorem.

"On the third of March (1970), I got up extremely early because the entrance examination was performed that day and I had to cooperate. I got on the subway. I felt sick and I felt as if I were walking in the cloud. I considered faintly how to obtain the closed path. I suddenly found D(z,z') operator. It took 40 minutes until I got off the train. But I had completely solved the problem when I got off the train. Until the last day of March, I completed the paper."

This experience of sudden illumination is similar to the experiences reported by Poincaré and other great mathematicians [7] who have described their moments of discovery. Taro Asano rightly belongs in their company. By his dedication to science, his flashes of brilliant insight, and his solid achievements, he has earned the respect of physicists all over the world. What he has done is only a small fraction of what he promised to do, and would have done, if he had lived.

Asano was not only a gifted physicist but also a human being with many-sided

interests and a rare sensitivity of spirit. I will not try here to describe the human side of his character. Instead I will let him speak for himself. The following brief extracts from his autobiographical letter show his acutely critical judgment applied to the phenomenon of his own personality:

"I could not agree with the Professor what problem I would be engaged with. I am extremely obstinate and proud."

"I am not very much fond of human beings and human affairs. I love music, nature and mathematics, because I cannot love human beings very much. And one cannot devote himself in the political issues without an interest in human beings."

"I was alone and heard people discuss who were radical. I felt that if a group of people continue persistently to assert that a man is an elephant, there appear people who begin to suspect that he is really an elephant, even though they are seeing him."

"The main principle of Buddhism is that everything changes day by day. What is true today will be not necessarily true tomorrow. Sincerely yours, T. Asano."

When I received this letter, with its sharp and yet good-humored analysis of the Japanese academic crisis and his own reactions to it, I little thought that I was reading Taro's obituary notice. Now he is dead, and the letter is all I have left to remind me of our friendship. To his spirit I can say only the words addressed by the poet Robert Bridges to his dead friend Gerard Hopkins:

"Go forth: amidst our chaffinch flock display
Thy plumage of far wonder and heavenward flight."

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